The Genus Oechalia (Pentatomidae, Hemiptera)

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(Presented by title by O. H. Swezey, at the meeting of January 4, 1940)

The genus *Oechalia* Stål belongs to the unaccountably predaceous subfamily Asopinae. The first specimens of *Oechalia* were collected on early voyages in the Pacific, the Hawaiian *grisea* on the "Reise um die Erde, von Dr. F. J. F. Meyen" (Burmeister, 1834), the Australian *consocialis* on the "Voyage de l'Astrolabe, pendant les années 1826-1829" (Boisduval, 1835) and the "Voyage autor du monde sur la Corvette la Coquille" (Guérin-Méneville, 1838), and the Hawaiian species, *patruelis* and *pacifica,* on the "Svenska Fregatten Eugenies Resa, 1851-1853" (Stål, 1859).

Due to the inadequate descriptions of the time and to the inaccessibility of the types, these early species have been confused in recent literature. Moreover, attempts to define the species precisely have been frustrated for want of knowledge as to the limits of specific variability.

The confused status of the Hawaiian species is illustrated by Kirkaldy's remarks (1902-1909). First considered as a single variable species (1902), Kirkaldy later (1907) discovered two types of eggs. In his "Notes on the Hemipterous genus *Oechalia*" (1909) he described a new species and resurrected at least one of Stål's species but completely confused the species of Burmeister and Stål, applying the names in his key to forms which did not even agree with the meagre details of the original descriptions. In his plate of illustrations accompanying this paper further confusion was added by his use of the name *pacifica* which had been rejected in favor of *patruelis* in the text.

Obviously the situation needed to be clarified by biological work to determine the limits of variation and by a review of the early literature. The life history work was started by me in 1935 at the Bishop Museum and was completed during my absence in 1936 by Miss Amy Suehiro. *Oechalia patruelis* Stål was reared through three successive generations, the bugs being fed on corn ear worm larvae at regular intervals. The size, coloration, shape of the humeri, and male genitalia remained constant throughout this work, thus providing a sound basis upon which to proceed.

Four hundred and twelve specimens collected mainly by O. H. Swezey, E. H. Bryan, Jr., W. M. Giffard and myself and fifty-six specimens from elsewhere in the Pacific, collected largely by E. C. Zimmerman, provided ample material for evaluation of the vari-

ous species. Upon checking the original descriptions carefully, it was found that all of the previously described Hawaiian species could be recognized. Revision of these determinations may be necessary when the types are examined but the present identifications appear to be correct. Inasmuch as all of the early collecting was done on Oahu it was only necessary to find characters in the descriptions of Stål and Burmeister sufficient for the identification of the limited number of species on this island. The fragmentary type of Kirkaldy's *kaonohi* and Van Duzee's types of *hirtipes* and *virgula* were available during the course of the work. As a result of the present study the number of species of *Oechalia* has been doubled, seven new species being described from various parts of the Hawaiian Archipelago. All types are deposited in the collection of the Bishop Museum and representative sets of all the species have been placed in the following collections: Hawaiian Sugar Planters' Experiment Station, Honolulu; United States National Museum, Washington, D. C.; British Museum (Natural History), London; and R. L. Usinger.

It is a pleasure to acknowledge the assistance rendered by Miss Amy Suehiro in completing the life history work and Mrs. Frieda Abernathy who so brilliantly illustrated the various stages in the life history.

DISTRIBUTION

The distribution of the genus *Oechalia* is, in some respects, very unique. The genus occurs over most of the Australian Region excepting the New Guinean, Melanesian, and Micronesian subregions. This tremendous range from Australia, Tasmania and New Zealand in the southwest to Rapa and remote Ducie in the southeast, thence northward through the Tuamotus, Marquesas and Line Islands to Hawaii and westward to Wake, embraces a large portion of Oceania. Negative evidence is never convincing in such little explored regions but the absence of *Oechalia* from New Caledonia, Tonga, and Samoa, though it is reported from Fiji, is difficult to understand. Absence from Guam and the Carolines probably means that it never reached Micronesia.

Most of this wide distribution represents the occurrence of the extremely variable *Oechalia consocialis*. Further study may reveal several species in this complex but the variation exhibited in the long series before me does not fall into distinctive types correlated with distribution. Hence there is no alternative but to consider this as a case of extreme variability. *Consocialis* does not reach the Hawaiian Islands but unaccountably occurs as far north as Fanning and Christmas Islands and then skips over to entirely isolated Wake Island.

The Hawaiian species of *Oechalia* form a distinct element which Kirkaldy has termed the subgenus *Hawaiicola*. The 13 species of

Hawaiicola occur mostly in the middle forest or upper forest zones though they may occasionally extend down to the lowlands. Most notorious of the lowland invasions was that of *kaonohi* during the campaign against the sugar cane leafhopper when it played a prominent role as a predator of this destructive insect in some of the sugar plantations of the island of Hawaii. It now exhibits the only case of discontinuous distribution among the Hawaiian Oechalias. All of the other species are either one-island endemics or occur on several adjacent islands.

LIST OF ONE-ISLAND ENDEMICS

virescens (Kauai)
patruelis (Oahu)
suehiroae (Maui)
similis (Maui)
acuta (Hawaii)
bryani (Hawaii)
ferruginea (Hawaii)
hirtipes (Hawaii)
virgula (Hawaii)

TWO-ISLAND ENDEMIC

grisea (Kauai and Oahu)

THREE-ISLAND ENDEMICS

swezeyi (Oahu, Molokai, and Maui)
kaonohi (Kauai, Maui, and Hawaii)

FIVE-ISLAND ENDEMIC

pacifica (all main islands except Hawaii)

Kaonohi stands alone among the various species groups. The remaining twelve species may be divided roughly into those with acute humeri and those with obtuse humeri. The group of species with acute humeri occurs at opposite ends of the island chain, *grisea, virescens,* and *patruelis* inhabiting Kauai and Oahu while the remaining four members of this group, *acuta, bryani, hirtipes,* and *virgula* are confined to the island of Hawaii. No species with acute humeri is known to occur on the intervening islands of Molokai, Lanai and Maui. On Hawaii two of the species with acute humeri are further isolated, nearly all records of *acuta* being on the slopes of Mauna Loa whereas *bryani* is apparently confined to Mauna Kea and its immediate environs.

The group of species with rounded humeri is common everywhere except on Hawaii and reaches its greatest development on the adjacent island of Maui. The single species, *ferruginea,* from Hawaii is very rare and is an aberrant member of the group. Typical of the group with rounded humeri is *pacifica,* a species which occurs on all of the islands except Hawaii and varies greatly but not consistently from island to island. The only other closely allied members of this group are *similis* and *suehiroae,* both confined to Maui. *Swezeyi* has angulately rounded humeri and has a distinctive facies. It occurs on the adjacent islands of Oahu, Molokai and Maui.

BIOLOGY

General features of the biology of the predaceous subfamily Asopinae are well known from the works of Kirkland (1897), Schumacher (1910-1911), Gulde (1919), and Knight (1923), while biological notes on the genus *Oechalia* have been contributed by Bergroth (1891), Swezey (1905), and Kirkaldy (1907 and 1909). Hence, detailed life history notes were more or less incidental in the present work. The object of these studies was to raise an *Oechalia* species through several generations in order to determine the limits of variation and hence the characters of specific importance in the group. As detailed below, this object was accomplished, adults having been obtained of the F_3 generation from an original group of fourteen eggs. It was discovered that the entire series was remarkably constant, both in morphological and color characters. The spines of the humeri were acute in all three generations and other specific characters were found to be equally reliable.

Oechalia patruelis Stål

Fourteen eggs were found on the under side of a *Coprosma* leaf in Haleauau Valley, Oahu, on March 8, 1936. They were arranged in an irregular "U"-shaped row, each egg glued at its base to the leaf and also fastened to its neighbor. From eggs laid later in captivity it was noted that newly laid eggs are pale cream color. They change within a few hours to olive-green or fuscous and develop a distinct bilobed cream-colored mark at the middle which extends nearly half the way around the egg. The eggs are subrounded and bear from seven to eleven (average 9.5) whitish "capitate processes" around the upper side. The dorsal surface (cap or lid) is smooth, polished, and fuscous at the middle but greenish white for a goodly area approaching the bases of the capitate processes. The chorion is finely granular throughout. The size is 1 mm. in diameter (slightly greater lengthwise to the bilobed pale marks), .84 mm. high to base of capitate processes, and 1.08 mm. total height to top of operculum. The capitate processes are .20 mm. in length and surround an area .88 mm. in diameter.

After four days the eye spots of the developing embryo become visible through the chorion. The general color is fuscous except for the ochraceous bilobed marks and the operculum at middle. The eye spots are red. The diameter increases to 1.05 mm. by 1.12 mm. and the height becomes 1.16 mm. The egg presents a decidedly asymmetrical appearance in lateral view because the side with the bilobed ochraceous mark is decidedly higher and more abruptly rounded than the gradually rounded other side.

On the fifth day the capitate processes are distinctly black tipped though they may become darker before this. The egg burster (Hey-

mons, 1906) which is so characteristic of Pentatomid eggs, becomes faintly discernible dorsally on the side nearest the eye spots. By the following day this becomes clearly visible as a black bar seen through the chorion.

Hatching takes place on the eighth day. The operculum breaks well above the insertion of the capitate processes at the "T"-shaped black egg burster. This is the elevated side of the egg where the vertex of the young nymph is located. The operculum raises as a broadly hinged flap as the bug swells tremendously by ingestion of air. The young nymph is bright orange at this time. When it is finally free of the shell the lid closes partially and the egg burster usually adheres to the front edge.

First nymphal instar. Freshly hatched nymphs become fully pigmented within a few hours. They appear relatively broad in this instar, the width across second abdominal segment exceeding the entire length of the insect, 35:: 34. The dorsal surface is strongly convex along middle and slightly expanded and flattened laterally. The head is strongly declivent, flattened above, the eyes small, tylus and juga distinct, the latter roundly reflexed laterally. The antennae are very thick, the apical segments being as thick as width of an eye, while the first three segments are more slender and are subcylindrical; proportion of segments one to four as 3:6:5:11. Rostrum very broad, almost as broad as thickness of femora, with the labial groove deeply impressed and conspicuous; labrum prominent, extending as a flap to apex of first segment; rostrum very long, attaining sixth abdominal segment. Thorax transversely wrinkled above, very broad, with a pale longitudinal line along middle revealing the line of sclerotic weakness where the break occurs during moulting. Abdomen very strongly convex, evenly rounded laterally but deflected posteriorly so that the apical segments are not visible from above. Underside comparatively flat, the lateral margins turned downward and the abdomen feebly emarginate at genital segments.

Color ferrugineous and pitchy black, the head, thorax, abdomen laterally except at sutures, legs, rostrum, and ventral abdominal segments laterally piceous. Elsewhere ferrugineous except for broad, transverse piceous marks dorsally on second abdominal segment, on third and fourth segments together, on fifth and sixth segments together, on apical margin of sixth and extending onto base of seventh and faintly on genital segments.

Size: Length 1.36 mm., width (abdomen) 1.4 mm., (head) .8 mm.

First instar nymphs are gregarious, clustering together and remaining motionless for long periods of time in the vicinity of the egg shells. This habit was noticed for a period of three days during which they increased greatly in size and became fully sclerotized.

Although no feeding was actually observed, the young bugs frequently touched the tips of their rostra to leaf surfaces so it is possible that they at least took up moisture and possibly some plant juices. On the fourth day they commenced to attack small caterpillars. There was still a tendency towards gregariousness at this time. Moulting occurred on the seventh and eighth days after hatching.

Second nymphal instar. Head and thorax distinctly longer, broader, and flatter than in the preceding instar. Antennae longer than head and thorax combined; proportion of segments one to four as 4:11:8:12. Rostrum slightly surpassing posterior coxae; proportion of segments one to four as 9:7:5:7. Thoracic nota moderately convex at middle, narrowly flattened laterally. Abdominal disk strongly convex. Color essentially as in first instar.

Size: Length 3 mm., width (abdomen) 2.1 mm., (head) .98 mm.

Average length of instar 4 days.

Third nymphal instar. Still larger but otherwise quite similar to preceding instar. Antennae scarcely longer than head and thorax combined; proportion of segments one to four as 4:18:12:16. Rostrum reaching to front margins of posterior coxae, proportion of segments one to four as 12:11:7:11. Thorax without trace of wing pads. Dorsal abdominal scent gland openings very distinct.

Size: Length 4.6 mm., width (abdomen) 2.85 mm., (head) 1.25 mm.

Average length of instar 3 days.

Fourth nymphal instar. General coloration and shape of head and abdomen much as in previous instar. Antennae slightly longer than head and thorax combined; proportion of segments one to four as 6:25:18:19. Rostrum reaching middle coxae, proportion of segments one to four as 15:14:10:15. Pronotum not abruptly flattened laterally, its posterior angles distinctly produced backward and its antero-lateral margins white. Hind margin of mesothorax strongly sinuate, roundly convex at middle, deeply concave sublaterally, and roundly produced as hemelytral pads laterally. Hemelytral pads scarcely reaching second visible abdominal segment. Hind margin of metanotum only feebly sinuate, the pads very feebly developed.

Size: Length 6.35 mm., width (abdomen) 4.05 mm., (head) 1.6 mm.

Average length of instar 8 days.

Fifth nymphal instar. Elongate oval and moderately convex above and beneath. Head broader across eyes than long, 38:30; disk subflattened and obscurely wrinkled; sides of juga sinuate in front of eyes, broadly rounded and a little dilated apically; slightly exceeding tylus which is narrowed basally and apically. Epicranial suture distinct on either side, extending from sublaterally on base of head to inner posterior angle of each eye, thus delimiting the

vertex as the postero-lateral portions of head behind eyes. Antennae inserted in front of eyes and beneath plate-like expansions of juga; distinctly shorter than head and thorax, measured on midline, 91 :: 100; proportion of segments one to four as 8 : 35 : 25 : 23. Rostrum very stout and broad, reaching to middle coxae, proportion of segments one to four as 20 : 17 : 13 : 15. Pronotum a little shorter than head on median line, three times as broad posteriorly as long on median line; disk transversely rugose and impressed by a fine longitudinal line along middle; depressed laterally on anterior half, the antero-lateral margins crenulate; anterior margins slightly concave; lateral margins feebly arcuate on anterior half, a little sinuate at posterior third and then moderately dilated, behind which the postero-lateral angles are strongly produced at sides of mesothorax, turned inward apically and subacute at tips; posterior margin slightly concave at middle, roundly produced over inner bases of hemelytral pads, concave again sublaterally beyond which the postero-lateral angles are produced as described above. Mesonotum large, rugosely punctate on triangular central portion and very finely, transversely wrinkled laterally on hemelytral pads; two-fifths longer than pronotum on median line where it is transversed by a similar fine longitudinal suture; posterior margin triangularly produced at center; hemelytral pads strongly produced laterally, reaching well onto third visible abdominal segment. Metanotum only briefly exposed on either side of triangular center of mesonotum, the metanotal wing pads broadly exposed at inner bases but concealed by hemelytral pads apically. Abdomen moderately expanded at sides, strongly convex above and beneath, with distinct, paired scent gland openings along middle of dorsal surface. First pair of scent glands smallest, situated on the anteriorly arched suture between third and fourth segments; second pair very prominent, enclosing a transverse elevated area and situated on the strongly anteriorly arched suture between fourth and fifth segments; third pair nearly as prominent as second and situated on the medianly arched suture between fifth and sixth segments. Lateral margins of abdominal segments above very narrowly carinate. Under surface rather smooth. Propleura sharply separated from lamellate pronotal margins, feebly elevated along anterior margins but with only ill-defined elevated areas in place of the propleural lobes of adults. Meso and metasterna flat, with a smooth but scarcely depressed trough about as wide as rostrum. Second abdominal segment briefly produced over basal segment at middle. Legs stout, inermous but for a small spine at middle of inner side of front tibiae. Femora each with an anteapical rounded elevation beneath. Femora clothed with short erect hairs, tibiae and tarsi with denser short hairs and some long ones. Tarsi consisting of two subequal segments. Claws with prominent, pad-like arolia.

Color of head and thorax above mostly black, the sides of pronotum broadly in front and narrowly behind and sides of hemelytral pads narrowly on basal half white. Eyes reddish. Antennae dark basally and ferrugineous apically with pale joints. Abdomen above white with transverse dark fuscous areas surrounding scent glands and with an additional spot between sixth and seventh segments where two small points exist along the suture and suggest a possible fourth pair of gland openings. Segments black laterally with pale along lateral margins at the center of each spot. Genital segments fuscous. Rostrum brown marked with black. Head fulvous beneath with a dark spot behind each eye and a dark stripe on each side behind antennae extending to base of head. Thoracic pleura pale, marked and spotted with brown. Sterna white. Legs mottled with ochraceous and dark brown, the tibiae dark basally and apically and pale at middle, tarsi black. Abdominal venter white with a gradually posteriorly increasing series of brown marks at middle of segments. Segments laterally marked as on dorsal surface with the spiracles brown. Genital segments brown.

Size: Length 9.15 mm., width (abdomen) 4.45 mm., (head) 1.9 mm.

Average length of instar 8 days.

Ecdysis. The process of moulting is similar in all instars. The bug swells, thus breaking the epicranial head sutures and the longitudinal thoracic suture. The anterior portion, including the frons and clypeus, of the nymphal head is bent forward as a flap and the thoracic terga are bent outward from the mid line as the bug emerges. Fifteen minutes are required for casting the old skin and the adult is fully sclerotized and pigmented after three and one-half hours.

Copulation was observed eight days after the last molt and the first eggs were laid six days later.

TAXONOMY

The best specific characters in *Oechalia* appear to be form of the humeri, length and shape of the abdominal spine, general coloration and to some extent body form, color and pilosity of legs, and size and shape of male genital plates and harpagones. In two cases the male genitalia provide practically the only differential characters but fortunately the rest of the species exhibit additional distinctive characters. Even in clear cut cases the male genitalia are so reliable and distinctive that they should be carefully studied. Identifications made on the basis of female specimens alone should always be considered as provisional.

The opening of the genital chamber is often concealed by the posterior abdominal terga or by the membrane. In such cases the capsule should be pulled outward and downward, preferably while

the specimen is still fresh. The operation is easily performed on relaxed specimens or the capsule may be removed from dried specimens and mounted on a card. Terminology of the genitalia follows that of Baker (1931). The width of the genital plates is measured from a caudal view along a transverse axis, the width being greater than the length (vertical measurement) in all cases.

The extent to which the humeri are produced is indicated by measuring the total width of pronotum across humeri and dividing this by the distance from the edge of a hemelytron at base to the apex of a humerus. For example, if the width of pronotum across humeri is 112 micrometer units and the humeri extend 14 units beyond the bases of hemelytra, then the humeral angles are produced one-eighth of the total width of pronotum beyond bases of hemelytra. The total width of an insect is always measured across the apices of humeri.

There is but little basis for a phylogenetic arrangement of species. However, the widespread and presumably generalized *consocialis,* with acute humeri, a short abdominal spine, and obsolescent propleural lobes, has been placed first. Then follow the various Hawaiian species, those with acute humeri first. Within each group the widest distributed species and those which occur on the oldest islands are placed before the one-island endemics which may exhibit unique characteristics and which are assumed to be derived or specialized.

Genus **Oechalia*** Stål

Oechalia Stål, 1862, Stett. Ent. Zeit., 23: 93.
Oechalia Stål, 1864, Hem. Afr., Vol. I, p. 63.
Oechalia Stål, 1870, Enum. Hemipt., 1: 58.
Oechalia, Blackburn, 1889, Proc. Linn. Soc. N. S. Wales (2)3: 343.
Oechalia, Kirkaldy, 1902, Fauna Haw., 3: 171.
Oechalia, Schouteden, 1906, Genera Ins., fasc. 52: 75.
Oechalia, Kirkaldy, 1909, Proc. Haw. Ent. Soc., 2: 82-84, pl. 2.
Oechalia, Kirkaldy, 1910, Fauna Haw., 2: 533.

Elongate-oval in form, broadest across humeri, tapering abruptly anteriorly and more gradually posteriorly. Feebly convex above, the pronotal disk even slightly concave between elevated humeri in some species, the head and anterior portion of pronotum moderately declivous; more strongly convex beneath.

Head as long as wide across eyes and only slightly (one-twelfth) shorter than pronotum on median line; a little elevated subbasally and at basal third of tylus; sides sinuate just in front of eyes, then briefly subparallel, evenly rounded or roundly truncate at apex. Sides of juga thick but beveled to a thin edge basally, thinnest at inner apical angles which converge to nearly or quite enclose the narrowed apex of tylus in some cases. Disk with a constant pattern of punctures and laevigate areas arranged in longitudinal rows. Juga punctured laterally except along the extreme edges, smooth and impunctate along the middle. Tylus laevigate but for deep punctures at middle of apical third and a row of punctures along either side of middle posteriorly.

* Oechalia, from Οιχαλια, a city on the island of Euboea in central Greece.

Eyes entirely surrounded by an impunctate area which extends to the ocelli but which is limited antero-medially by an ill-defined oblique suture mesad of which there may occur a smooth area containing only one or two punctures. Three longitudinal glabrous stripes in punctate area of head between ocelli and behind tylus, the median stripe being a continuation of that of middle of tylus, whereas the lateral stripes are interrupted by one or two deep punctures from the medially widening laevigate jugal areas. Eyes but little prominent, not surpassing level of anterior angles of pronotum, two-fifths as wide as interocular space, contiguous with anterior pronotal angles. Ocelli located slightly behind level of posterior margins of eyes, over four times as far apart as distance from ocelli to eyes or to hind margin of head. Under surface nearly impunctate, with prominent antenniferous tubercles arising at front margins of eyes, partially visible from above, divided by a suture on apical third. Hypostomal region just behind rostrum with a transversely rugose, shallowly depressed area bounded on either side by feeble longitudinal carinae which disappear well before base of head. Rostrum inserted behind apex of head, the intervening space being occupied by the labrum. Bucculae small but distinct laterally, forming a continuous but very feeble arch behind rostrum. Rostrum reaching about to hind margins of middle coxae, stout and flexible, the basal segment widest, as wide as thickness of front femur, second widest at apex where it is one-third narrower than basal segment, third only slightly narrower than second at its widest point at basal third, fourth less than half as wide as first at base, tapering to apex; first, third and fourth segments subequal or decreasing slightly in length in the order given. Second segment one-third longer than the others. First segment reaching to basal fourth of head. Antennae simple, slightly shorter than combined lengths of pronotum and scutellum, inserted directly in front of the eyes and partially beneath bases of juga. First segment not reaching apex of head, cylindrical, second and third segments slightly enlarged apically, fourth widest at middle, fifth feebly fusiform. First segment shortest, fourth longest, about three times as long as first, the remaining segments subequal or the fifth slightly the longest, or shortest, sometimes nearly as long as fourth.

Pronotum more than twice as broad across humeri as long. Front margin roundly concave, especially so behind interocular space. Antero-lateral angles scarcely to distinctly produced as blunt teeth with a continuous row of approximately a dozen rounded teeth along obtuse antero-lateral margins extending half way to humeral angles. Humeral angles more or less strongly produced and acuminate, directed laterally or bent slightly backwards and often feebly elevated. Apices always simple. Posterior angles subroundly produced over basal angles of scutellum, the posterior margin of pronotum concave between these angles. Disk deeply punctate in irregular rows, the margins narrowly impunctate. Laevigate anterior margin continuing posteriorly between callosities with lateral branches just in front of callosities. Callosities transverse, bounded by a row of deep punctures on all sides, surrounding an elevated laevigate area at middle, their surface minutely granular.

Scutellum three-fourths longer than pronotum on median line, subtriangular in outline, the base being feebly arcuate, nearly straight at middle but obliquely truncate laterally at posterior angles of pronotum. Sides rather evenly posteriorly narrowed on basal four-sevenths, the apical narrowed portion more gradually tapering to acutely rounded apex. Disk moderately elevated on basal fourth, feebly depressed on apical fourth, coarsely punctate in irregular rows, with a percurrent but anteriorly ill-defined impunctate longitudinal line at middle. Punctures finer and sparser on apical fourth.

Hemelytra exceeding tip of abdomen, corium about one-third longer than scutellum. Emboliar suture distinct on basal three-fourths, the single row of emboliar punctures at base diverging into about four irregular rows posteriorly. The rest of corium generally but very irregularly punctured except for two rows along claval suture. Clavus narrowed posteriorly, terminating beneath the attenuated portion of scutellum, with three rows of punctures basally narrowed to a single row towards the apex.

Membrane generally lightly infuscated with eight more or less distinct dark brown longitudinal veins. The three simple inner veins arising from a single basal arm which then curves around to follow the course of apical margin of corium, giving off the long simple fourth vein, an arm which forks to produce the fifth and sixth veins, and an outer seventh vein. This last unbranched but joining the irregular and apparently independent outermost or eighth vein near apex.

Exposed portion of connexivum very finely, evenly punctured except along smooth, impunctate edges. These edges are very narrow on the anterior portion of each segment but widen slightly so that the posterior angles are very briefly but distinctly produced and acute. They are increasingly acute on the posterior segments.

Under surface in great part shallowly to distinctly punctate, the thoracic sterna and middle of venter impunctate. Propleura with a more or less distinct short spine sublaterally beneath and near the base of humeral spines. Anterior propleural margin moderately to strongly carinate on either side, forming a reflexed lamella which extends sinuately from anterior angle of pronotum around hind margin of eye, then curves forward in front of anterior acetabula and is produced as a brief or prominent rounded lobe on side of prosternum. Prosternum widening anteriorly, the anterior margin concave at center and convexly arcuate on either side forming brief plate-like extensions in front of propleural carinae; disk feebly punctured laterally on anterior half and extending along anterior lateral plates. Mesosternum impunctate, longitudinally depressed into a distinct minutely pubescent groove. Suture between meso and metapleuron dull only very narrowly along edges, briefly parting near the middle, the ostiolar orifice opening between the middle and hind acetabula into a very brief, ill-defined groove without elevated canal or well defined evaporating area. Posterior and lateral margins of metapleura set off by a rounded suture, moderately reflexed and, at least posteriorly, plate-like. Metasternum forming a strong transverse ridge. Abdominal venter with sparse, erect or posteriorly directed hairs. Second visible ventral segment strongly produced forward, covering the first segment which is reduced to a single ridge at center. The abdominal spine continues between coxae, attaining at least the middle coxae, tapering towards apex, compressed on inner or dorsal side, bent slightly downward apically and subrounded at apex.

Sixth visible abdominal segment in the male deeply, roundly emarginate ventrally, broadly produced as a thickened lobe sublaterally and briefly, acutely produced at postero-lateral angles. Seventh visible abdominal segment reduced, submembranous and briefly exposed ventrally at base of eighth visible segment. This last (actually the ninth segment) is the genital segment. At rest it is retracted into the preceding segments so that the posterior or ventral surface only may be visible. The segment (see figure 1) is capsule-like, about two-thirds or three-fourths as deep as wide with the ventral margin produced outward and upward to form a genital chamber. The ventral margin is roundly emarginate at center and briefly, narrowly notched laterally. The dorsal surface of the capsule is longitudinally carinate and the postero-dorsal border is concave at the middle where it forms an arch over the proctiger. It is feebly emarginate on either side of the slightly produced median carina, with an elevated and feebly produced knob on either

side just laterad of the concavity, each knob bearing a linear tuft of long, posteriorly directed bristles. The postero-dorsal border is rather evenly rounded on either side of middle to lateral angles and bears scattered bristles directed caudad and mesad. The ventral surface of the capsule is feebly concave posteriorly and is densely clothed with long stiff hairs.

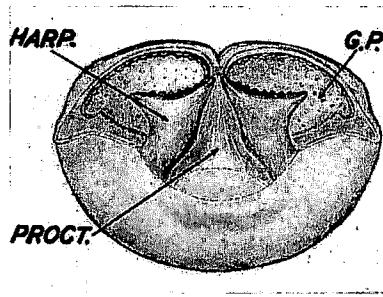


Figure 1. *Oechalia pacifica* (Stål) Haleakala, Maui. Caudal view of male genital capsule showing the genital plates (G.P.), harpagones (HARP), and proctiger (PROCT.).

Inside the genital chamber are located the proctiger, genital plates, and harpagones (figure 1). The proctiger is median and prominent. It is longitudinally carinate and slightly concave along the middle. The genital plates vary in size and shape according to the species. They are attached to the inner dorsal wall of the genital chamber and occupy the dorsal area on either side of the proctiger. They are wider than long, concave, and covered on the concave face with distinct tubercles. The harpagones arise from the center of the genital chamber and project caudad, curving upward to face the genital plates. They are variously compressed or dilated apically, usually with more or less distinct lateral arms forming a subtriangular apex and with a notched or crenulate inner face opposite the genital plates.

Sixth visible ventral segment in the female likewise roundly emarginate but more broadly so than in the male with the margins thickened but not produced sublaterally. Postero-lateral angles briefly, acutely produced. Basal genital plates subtriangular, broad, the anterior and posterior margins more or less rounded. Disks feebly punctured and clothed with erect hairs posteriorly. Apical plates smaller, likewise subtriangular, about as long as broad, subrounded apically, and indented at inner basal angles to receive lateral basal extensions of median lobe. Median lobe very small, twice as broad as long, evenly rounded on posterior margin. Lateral lobes roundly produced and thickened, extending well beyond level of apical connexival angles, connected medially by a shallow, subrectilinear emargination of last abdominal tergite.

Legs inermous. Coxae and trochanters impunctate. Femora moderately incrassate, being slightly thickest at middle, very superficially or not at all punctate and sparsely beset with erect hairs which may become as long as the thickness of femora. Tibiae slightly enlarged apically, clothed with erect bristles which are as long as the thickness of tibiae and with shorter dense hairs at inner apex. Tarsi a little over half as long as tibiae, the first segment longest, second shortest, third a little shorter than first, thickened apically

and bearing two prominent, curved claws with pad-like arolia beneath each. Tarsi with short dense hairs along ventral face and with long erect bristles apically.

Ground color varying from testaceous or ochraceous to fuscous or ferrugineous with dark brown to black stripes on punctate areas of head and surrounding ocelli and with more or less extensive dark brown or black areas on pronotal, scutellar and hemelytral disks. Scutellum darkest on basal and on subapical fourths and ivory-white at apex. Membrane brownish hyaline with darker veins. Finely punctate inner plates of connexivum black at least along sutures. Under surface in great part pale with superficial brown punctures laterally. Antennae fuscous or fulvous to ferrugineous. Eyes usually brown. Ocelli pale or with a reddish tinge. Rostrum infuscated apically. Legs ochraceous to fulvous with darker spot on femora and with claws tipped with dark brown. Harpagones and genital plates usually dark brown.

Size ranging from 7½ to 14 mm. in length and from 4 to 7 mm. in width across humeri.

Genotype: *Arma schellenbergi* Guér. (= *Oechalia consocialis* Boisduval).

Oechalia belongs to the group of Asopinae with the scutellum moderately developed and simple at apex, the head a little shorter than the pronotum, the eyes contiguous to anterior margin of pronotum, the juga simple, the anterior femora inermous, the rostrum with first, third and fourth segments subequal, second a little longer, and with a very prominent, strongly produced spine from the second visible abdominal segment.

Oechalia differs from all related genera in the possession of a broad longitudinal sulcus or depression along the mesosternum. This is a striking contrast to the usual carina, often very prominent and grooved, which is seen in most Asopinae. Another distinctive character is the distinctly elevated, sinuate anterior propleural margin which is produced mesad to form a tubercle on either side of the prosternum.

Oechalia bears a superficial resemblance to *Platynopus* and *Parealda,* both Pacific genera, but both of these have prominent mesosternal carinae and short abdominal spines and *Platynopus* has anteapical spines on the front femora. The large American genus *Podisus* is likewise related to *Oechalia* superficially, some species having inermous front femora and other *Oechalia* characters. *Podisus* has a low but distinct mesosternal carina, however, and a very short abdominal spine. The genital plates of *Oechalia* are not unlike those of the American *Alcaeorhynchus* and the cosmopolitan *Zicrona.*

To summarize, it may be said that *Oechalia* occupies a rather isolated and unique position in the subfamily Asopinae with no really close relatives known.

KEY TO THE SPECIES OF OECHALIA

1. Abdominal spine short, not surpassing middle coxae. Propleural lobes obsolescent on either side of prosternum. Subhumeral spines only feebly developed. Australia, New Zealand, Polynesia except Hawaiian Islands. Subgenus *Oechalia*.....(1) *consocialis*

—. Abdominal spine long, surpassing middle coxae. Propleural lobes distinctly produced on either side of prosternum. Subhumeral spines small but distinct. Hawaiian Islands. Subgenus *Hawaiicola* ..... 2.

2. Humeri strongly produced into straight or slightly sinuate, acute or subacute spines which extend about one-eighth of the total width of pronotum beyond bases of hemelytra..... 3.

—. Humeri only briefly, roundly or subangulately produced, extending one-twelfth or less of the total width of pronotum beyond bases of hemelytra ..... 9.

3. Ground color ferrugineous marked with the usual fuscous to black punctures and with the scutellum pale at apex. Legs densely clothed with long, erect hairs, those of femora about two-thirds as long as thickness of femora. Abdominal spine reaching middle of mesosternum, tapering and subrounded at apex and bent feebly downward apically. Genital plates less than one-third the width of capsule. Harpagones feebly dilated apically, the width across tips of arms three-fifths as great as width of genital plate. Hawaii .....(8) *hirtipes*

—. Ground color never distinctly ferrugineous. Hairs of legs shorter or less dense..... 4.

4. Upper surface distinctly tinged with green. Abdominal spine reaching middle of mesosternum, tapering, rounded at apex and bent downward. Genital plates less than one-third the width of capsule. Harpagonal arms well developed, especially the ectal one, width across arms three-fourths the width of genital plates. Kauai .....(3) *virescens*

—. Upper surface never tinged with green..... 5.

5. Legs usually red. Abdominal spine very long and slender, reaching nearly to front coxae, bent downward toward apex. Genital plates large, one-third the width of genital capsule. Harpagonal arms feebly produced, the width across arms one-half to two-thirds the width of genital plates. Oahu.....(4) *patruelis*

—. Legs ochraceous or fulvous. Genitalia otherwise..... 6.

6. General coloration usually appearing as light brown because of extensive ochraceous ground color and fuscous punctures. Genital plates a little less than one-third as wide as capsule. Harpagonal arms strongly produced, four-fifths as wide across apices as width of genital plates. Kauai and Oahu.....(2) *grisea*

—. General coloration usually darker. Harpagones less strongly dilated apically. Hawaii..... 7.

7. Humeral angles strongly sinuate. Genital plates large, a little more than one-third as wide as capsule. Harpagones asymmetrical, the ectal arms entirely wanting and width at apex only one-third that of genital plates. Hawaii.....(7) *virgula*

—. Humeral angles less strongly sinuate or straight. Genital plates relatively smaller and harpagones more symmetrical..... 8.

8. Upper surface with extensive dark areas. Humeri straight. Abdominal spine relatively short, reaching to about middle of mesosternum. Size relatively large, 11½ to 12 mm. Genital plates less than one-third as wide as capsule. Harpagonal arms

moderately produced, two-thirds as wide across apices as width of genital plates. Slopes of Mauna Loa.....(6) *acuta*

—. Upper surface with less extensive dark areas. Humeri feebly sinuate. Abdominal spine long and slender, reaching front coxae. Size smaller, 9½ to 11 mm. Genital plates less than one-third as wide as capsule. Harpagonal arms about two-thirds as wide across apices as width of capsule. Slopes of Mauna Kea .....(5) *bryani*

9. Body long and slender, nearly two and one-half times as long as broad, 11::4½. Pronotum relatively narrow, the humeri extending only about one thirty-second of the total width of pronotum beyond bases of hemelytra. Pronotum little more than twice as broad across humeri as long, 95::45. Abdominal spine reaching a little beyond middle of mesosternum, nearly straight, the apex angulate at least dorsally. Genital plates slightly more than two-thirds as wide as capsule. Harpagonal arms strongly asymmetrically produced, the distance across apices nearly as great as width of genital plates, 19::18. Hawaii, Maui, Kauai.....(14) *kaonohi*

—. Body form shorter and broader, never more than twice as long as broad. Pronotum broader, the humeri extending one-twelfth to one-eighteenth of total width of pronotum beyond bases of hemelytra. Harpagonal arms never so strongly produced..... 10.

10. Color in great part ferrugineous. Humeri moderately, angulately produced, extending about one-twelfth the total width of pronotum beyond bases of hemelytra. Hawaii.....(9) *ferruginea*

—. Color light or dark brown. Humeri shorter, extending only one-fourteenth or one-sixteenth the total width of pronotum beyond bases of hemelytra. All islands except Hawaii..... 11.

11. Coloration light brown, the ground color testaceous with light brown punctures. Abdominal spine short, reaching only to middle of mesosternum, tapering to briefly rounded apex. Humeri very briefly but angularly produced. Genital plates small, about one-fourth as wide as capsule. Harpagonal arms distinctly produced, five-sixths as wide across apices as width of genital plates. Molokai, Maui, Oahu.....(13) *swezeyi*

—. Color usually darker. Abdominal spine long and slender, reaching nearly to front coxae, bent downward and then slightly recurved at tip ..... 12.

12. Upper surface nearly concolorous, generally fusco-ferrugineous with pale areas, including apex of scutellum, only faintly indicated. Humeri very short, extending about one-sixteenth the total width of pronotum beyond bases of hemelytra. Genital plates small, one-fourth as wide as capsule. Harpagones five-sixths as wide across apices of arms as width of genital plates. Maui.....(12) *suehiroae*

—. Upper surface brownish to nearly black with sharply contrasting white markings particularly on apex of scutellum. Humeri a little more produced, extending one-fourteenth the total width of pronotum beyond bases of hemelytra..... 13

13. Genital plates less than one-third as wide as capsule, 14::50. Harpagonal arms scarcely produced, the apices of harpagones triangular in shape, less than half the width of genital plates, 6::15. Known only from Kula Pipe Line, 4500 feet, Maui.....(11) *similis*

—. Genital plates larger, two-fifths as wide as capsule, 19::47. Harpagones strongly asymmetrical, the ental arms produced upward almost as continuations of inner edges while the ectal arms are bent abruptly downward. Width measured obliquely across apices of arms about three-fifths the width of genital plates, 12::19. Kauai, Oahu, Molokai, Lanai, Maui.....(10) *pacifica*

Subgenus **Oechalia** Stål, Kirkaldy (1909)

Oechalia Stål, Kirkaldy, 1909, Proc. Haw. Ent. Soc., 2:83 (typical subgenus).

Propleural ridge reduced, the lobes on either side of prosternum only feebly developed. Spine of second abdominal segment not extending beyond middle coxae.

Genotype: *Arma schellenbergi* Guér. (= *Oechalia consocialis* Boisduval).

1. **Oechalia consocialis** (Boisduval)

Pentatoma consociale Boisduval, 1835, Voy. Astrol., Entom., 2:630, pl. 11, fig. 9.
Pentatoma schellembergi Guérin, 1838, Voy. Coq. Zool., 2:166, pl. 11, fig. 9.
Oechalia schellenbergi, Mayr, 1868, Reise Freg. Novara. Hem., p. 32.
Rhaphigaster perfectus Walker, 1867, Cat. Heter. Br. Mus., 2:371.
Oechalia consocialis, Stål, 1870, Enum. Hemipt., 1:59.
Oechalia consocialis, Schouteden, 1906, Genera Insectorum, fasc. 52:75, pl. 5, fig. 12.

Male. Head as long as wide across eyes, a little shorter than pronotum on median line, 36::40. Antennae as long as pronotum and scutellum together, proportion of segments one to five as 7:20:22:25:21. Rostrum extending to middle coxae, the proportion of segments one to four as 15:20:15:15. Pronotum two and one-half times as wide across humeri as long on median line; humeral angles produced about one-fourteenth of total width of pronotum, 7::100, beyond bases of hemelytra, gradually and fairly evenly narrowed to an acute point. Scutellum two-thirds as long as width of pronotum across humeri, three-fourths as broad at base as long; disk rather strongly elevated on anterior third, less so at middle, and lowest on apical third, punctate much as on center of pronotal disk with basal angles narrowly and a slender, feebly raised longitudinal line along middle impunctate and the apical region sparsely punctate; sides of narrowed apical third gradually rounded to scarcely acute apex. Connexival angles not backwardly produced, nearly right angles. Propleural carina ill-defined adjacent to acetabulum and only feebly produced at edge of prosternum in front of anterior coxa. Propleura each with a small, ill-defined elevation or tubercle beneath humeral angle adjacent to base of hemelytra. Abdominal prolongation gradually narrowed and rounded apically forming a continuous line with the gradually elevating mid line of the abdomen and reaching level of middle of intermediate coxae. Femora sparsely beset with erect bristles which are one-fourth to one-third as long as thickness of femora.

Genital plates nearly one-third as wide as entire width of genital cup, 10::33, and three-fourths as long as wide. Shape roughly rectangular but the inner dorsal margin subrounded on median half with only a small tubercle to indicate the angle. Outer dorsal angle distinctly produced. Lateral margin concave. Ventral margin and to a less extent dorsal margin crenulate. Disk distinctly concave, irregularly and inconspicuously tuberculate. Harpagones prominent, four-fifths as wide as genital plates, with nine teeth on the inner surface and with lateral arms about equally produced on either side. Female, with basal genital plates subrounded posteriorly. Apical plates subtriangular, about as long as broad, subrounded apically, indented at inner basal angles to receive lateral basal extrusions of median lobe. Median lobe twice as broad as long and evenly rounded on posterior margin. Lateral lobes extending slightly beyond apical connexival angles, rounded.

Color fuscous to ferrugineous mottled with more or less extensive ochraceous laevigate areas between punctures. Antennae brown, legs pale testaceous on coxae and trochanters, fulvous mottled with brown or orange on femora, apices of tibiae and all of tarsi brown. Eyes brown. Rostrum pale with apical segment brown. Head black above with an ochraceous stripe along middle of each jugum, three ochraceous stripes on vertex, the middle one extending forward and embracing most of tylus. Ochraceous immediately surrounding eyes, fuscous at apex of antenniferous tubercle above, and testaceous on under surface. Pronotum ochraceous with brownish ferrugineous punctures, brown callosities, and nearly black humeral angles. Scutellum broadly dark brown at middle of basal fourth and again at subapical fourth, elsewhere ochraceous with brown punctures except on apical fourth where the punctures are likewise pale. Clavus, corium and embolium ochraceous with brown punctures except broadly at middle, near inner apex and along apical margin of corium where there is a suffusion of ferrugineous. Membrane clear hyaline with dark brown veins and a generally embrowned stripe near apex at connecting of outer two veins. Connexivum broadly black at base and apex of each segment, pale in between, the impunctate extreme margin pale except for narrowly black posterior angles. Under surface in great part yellowish testaceous with the punctures laterally brown and with sides of abdominal venter more generally suffused with brown or reddish. Mesosternum red on either side of median sulcus. Genital cup externally pale. Genital plates and apices of harpagones brown.

Described from material collected by E. C. Zimmerman on Rapa Island in July, 1934. Nearly one hundred specimens of this widespread species are at hand from the following localities: Australia, Fiji, Fanning, Christmas, Wake, Ducie, Rapa, Oeno, Pitcairn, Society islands of Tahiti, Raiatea, Tahaa and Bora Bora, Marquesan islands of Eiao, Mohaotani, Uahuka, Uapou, Tahuata, Hatutu, and Fatuuku, Tuamotu islands of Makatea and Fakarava, Austral islands of Rimatara and Raivavai, and Mangarevan islands of Akamaru, Aukena, Mangareva, Agakauitai. It has also been recorded from Tasmania and New Zealand. Taken during the months from May to August inclusive.

A tremendous degree of variation is exhibited in this species. The smallest specimens (7½ mm.) with the pale laevigate areas of upper surface predominant are from widely separated Christmas Island in the Line Island group and Aukena Island in the Mangarevan group. The largest specimens (11½ mm.) are from Australia and Rapa but much smaller specimens occur in both of these places. The darkest specimen is from Rapa as is also the most uniformly ferrugineous specimen.

There would be ample justification for the separation of geographical subspecies if these superficially striking differences were at all constant or consistent. However, in the absence of any apparent correlation, at least in the present material, I am obliged to consider these forms simply as variants within the single widespread and extremely variable species.

Subgenus **Hawaiicola** Kirkaldy

Hawaiicola Kirkaldy, 1909, Proc. Haw. Ent. Soc., 2: 83.

Prosternum with a well developed lobe on either side. Spine of second abdominal segment extending well beyond middle coxae.

Genotype: *Asopus griseus* Burmeister.

Although the above differences are only quantitative and certainly not of generic significance, they serve admirably to separate the Hawaiian species from the widespread *consocialis*. Hence the subgenus is retained.

2. **Oechalia grisea** (Burmeister)

Asopus griseus Burmeister, 1834, Nova Acta Ac. Leop., XVI, Suppl., p. 293.

Male. Head shorter than width across eyes, 36:: 40, shorter than pronotum on median line, 36:: 40; punctures of upper surface very dense, numerous and confluent leaving the impunctate areas as distinctly delimited, laevigate longitudinal elevations. Antennae about seven-eighths as long as combined lengths of pronotum and scutellum on median line, proportion of segments one to five as 8: 20: 21: 24: 20. Rostrum reaching nearly to apices of middle coxae, the proportion of segments one to four as 19: 19: 15: 12. Pronotum nearly three times as broad across humeri as long on median line, 114:: 40, the humeral angles strongly produced, slightly backwardly directed, elevated so that the pronotal disk is concave between the humeri, anterolateral margins distinctly, deeply crenate, bearing 9 or 10 rounded teeth. Humeral angles produced about one-eighth the total width of pronotum beyond bases of hemelytra. Connexival angles distinctly produced as short acute spines. Anterior prolongation of second abdominal segment very stout and long, slightly curved ventrad from the continuous axis of the mid venter of the abdomen near its apex and reaching well past intermediate coxae to or near front margin of mesosternum. Legs only sparsely pubescent, the hairs of femora about one-third as long as the thickness of femora.

Genital plates nearly one-third as wide as width of genital cup, 15:: 49, half again as wide as long, 15:: 10, the dorsal and ventral sides rather evenly arcuate and crenulate forming an inner obtuse angle, these margins distinctly crenulate. Outer dorsal angle produced into a short, broad arm, the outer margin consequently deeply notched. Disk concave and covered with small but distinct tubercles. Harpagones stout, branching apically to four-fifths the width of genital plates, ectal arm much longer and more slender than ental arm, inner surface facing genital plates with about ten blunt elevations or teeth. Lateral lobes of female genitalia not rounded apically, produced into thickened and rounded lobes either side of the central depressed area. These lobes and the slightly enlarged posterior portions of apical plates bearing numerous stiff hairs.

Color ochraceous with black or fuscous punctures, the confluent punctures of the head black. Humeri blackish. Scutellum pale apically, often darkened subapically and basally. Connexivum distinctly alternated. Veins of membrane dark brown to black. Eyes and callosities brown. Antennae pale on basal half, fulvous apically. Rostrum pale with fulvous at extreme apex. Legs rather uniformly ochraceous or fulvous with slightly darker tarsi. Abdominal prolongation very pale, slightly transparent.

Size ranging from 9½ mm. by 5½ mm. (smallest male) to 13½ mm. by 7½ mm. (largest female).

Described from a male collected by J. C. Bridwell on Mt. Tantalus, Oahu, June 10, 1917, and a female collected by W. M. Giffard at 1300 ft. on Mt. Tantalus, February 19, 1905.

Other material before me is from Tantalus, Lanihuli, Manoa-Palolo Ridge, Nuuanu Pali, Kalihi, Leilehua, Waiahole, Wailupe, Palikea, and Moanalua in the Koolau Range and Kaala and Palehua in the Waianae Mountains of Oahu taken in all months of the year except February, March, July and August by E. H. Bryan, Jr., O. H. Swezey, G. W. Kirkaldy, W. M. Giffard, T. Blackburn and R. L. Usinger.

Perfectly typical specimens from the island of Kauai are from Puu Ka Pele, Alakai Swamp, Kumuwela, Kaholuamanu, Halemanu, Kokee, and Kalalau, taken in all months of the year except March, April, June, and November by O. H. Swezey, J. A. Kusche, T. Blackburn, C. N. Forbes, A. M. Adamson, and R. L. Usinger.

The allotype of Van Duzee's *Oechalia virgula* and one female paratype, both from Oahu, most certainly belong here as does another female paratype from Kauai. Mr. Van Duzee's species is readily recognizable by the characters of the male genitalia but is difficult to separate from *grisea* females. *Virgula* is confined to the Island of Hawaii according to present authentic records of males.

The type of *grisea* is not available but Burmeister gave as his locality "Von den Sandwich Inseln, Oahu," so specimens with sharp humeri like but a little shorter than *"Asop. bidens"* (= *Picromerus bidens* Linn.) from Mt. Tantalus, which is the most accessible mountain collecting place to Honolulu, have been selected as typical. Variation, as in other *Oechalias,* is very great, the humeri sometimes being a little less produced than described. They are always distinctly produced and acute, however. The color is much darker in some specimens and is tinged with ferrugineous in a few.

3. **Oechalia virescens** Usinger, new species

Allied to *grisea* and *patruelis* with humeri as strongly produced and sharp as in those species. Male genitalia small, the harpagones nearly as wide as the genital plates, as in *grisea.* Upper surface entirely or in great part suffused with green.

Head about as long as wide across the eyes, 36 : : 37, and but little shorter than pronotum on median line, 36 : : 40. Antennae nearly as long as combined lengths of pronotum and scutellum, 102 : : 106; proportion of segments one to five as 8 : 20 : 21 : 27 : 26. Rostrum reaching to hind margins of middle coxae; proportion of segments one to four as 19 : 19 : 13 : 14. Pronotum two and four-fifths as broad across humeri as long, 112 : : 40, the humeri strongly produced, acute, extending about one-eighth the total width of pronotum beyond bases of hemelytra on either side. Connexival angles slightly but distinctly produced, acute, especially on posterior segments. Under surface as in allied

species, the abdominal prolongation extending to middle of mesosternum. Femora bearing erect hairs which are one-half the thickness of femora.

Genital plates small, much less than one-third the total width of genital cup, 13::46; about two-thirds as long as wide, the dorsal margin scarcely arcuate; inner and ventral margins rounded, the outer margin distinctly produced at dorsal angle. All margins crenulate and the surface concave and distinctly tuberculate. Harpagones with well developed arms, the ectal arm a little longer than the ental arm. Width of harpagones at tips three-fourths or more the width of genital plates. Female genital plates as in related species.

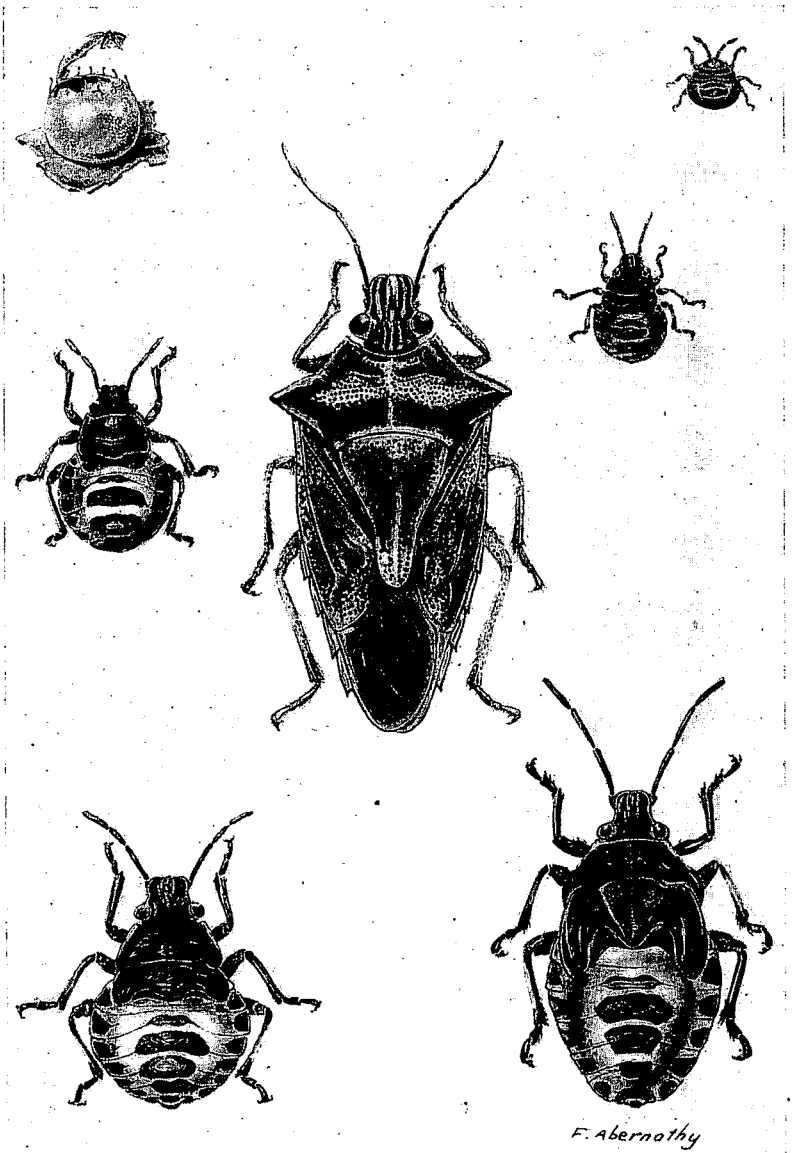
Color ochraceous with greenish punctures and with the entire inner portion of apical half of corium green, the embolium and outer half of apex of corium beyond embolium ochraceous to testaceous with only small black punctures. Apical third of scutellum white or ochraceous. Connexivum alternated with black and pale. Under surface and legs testaceous to fulvous marked with brown punctures and somewhat suffused with rufous. Antennae, tarsi, and apex of rostrum light brown, eyes darker brown.

Size: male, length 9½ mm., width 5¾ mm.; female, length 12 mm., width 7½ mm.

Holotype, male, Kokee, Kauai, August 21, 1921, O. H. Swezey. Allotype, female, Kaholuamanu, Kauai, April 22, 1920, J. A. Kusche, from the collection of W. M. Giffard. Eleven paratypes as follows: males, Kumuwela, Kauai, August 28, 1921, on *Straussia;* Halemanu, Kauai, August 18, 1921; and trail from Kokee to Kalalau, Kauai, August 5, 1925, on *Scaevola,* all collected by O. H. Swezey; Kokee, Kauai, February 1919, J. A. Kusche collector; and Alakai Swamp, Kauai, July 10, 1928, A. M. Adamson collector; females, two specimens, Kauaikinana, Kauai, August 2, 1925, O. H. Swezey collector; Kokee, Kauai, January, 1919, J. A. Kusche; Wahiawa, Kauai, June 1914, C. M. Cooke collector; Waialae River, Kauai, 4000 feet, April 14, 1920, J. A. Kusche collector, from the collection of W. M. Giffard; and Makaweli, Kauai, 2000 ft., R. C. L. Perkins. Five additional specimens from the Kusche collection are labeled "Honolulu, Oahu, June 4, 1919." Inasmuch as no other specimens of this striking species have come to notice from Oahu in all the years of collecting on that well known island and considering the fact that other Kusche material has been found to be mislabeled by entomologists in other groups, it is here assumed that these labels are erroneous. Subsequent collecting will determine whether this assumption is justified or not.

Variation is mostly confined to the extent of green coloration and to the general coloration of the under surface. All specimens are distinctly tinged with green but in one specimen this green covers the entire dorsal surface and the under surface and legs are very dark.

The sharp humeri, form of the male genitalia, and green coloration will distinguish this species from all others.



EXPLANATION OF PLATE

Oechalia patruelis (Stål) hatched egg on a Coprosma leaf, five nymphal stadia and adult from Haleauau Valley, Waianae Mountains, Oahu, the eggs collected on March 8, 1936.

4. **Oechalia patruelis** (Stål)

Arma patruelis Stål, 1859, Kongl. Svenska Fregattens Eugenies Resa Omkring Jorden. Insecter III, pp. 220-221.

Allied to *grisea* and occurring together with that species on the island of Oahu. As in *grisea* the humeral angles are strongly produced and acute but the legs are usually red in color and the harpagones are much less expanded at their tips, being only half as wide as the large genital plates.

Head nearly as long as wide, 38 : : 40, and but little shorter than pronotum on median line, 38 : : 42. Antennae seven-eighths as long as the combined lengths of pronotum and scutellum on median line, 98 : : 112, the relative length of segments one to five as 8 : 21 : 18 : 26 : 25. Rostrum scarcely surpassing middle coxae, the proportion of segments one to four as 15 : 18 : 14 : 14. Pronotum about two and two-thirds as broad across humeri as long on median line, 113 : 42; humeri strongly produced, extending about one-eighth of the total width of pronotum beyond bases of hemelytra on either side, rather strongly elevated in the plesiotype but not conspicuously so in other specimens, acute. Connexival angles sharp, those of anterior segments scarcely produced, becoming more prominent posteriorly. Under surface much as in other species, the subhumeral spines prominent, propleural carinae distinct and well developed. Abdominal prolongation extending nearly or quite to front margin of mesosternum. Legs only slightly pubescent, the femora with sparse, erect bristles which are much shorter than thickness of femora.

Genital plates large, one-third the total width of genital cup, half again as wide as long, 18 : : 11; dorsal margin evenly, moderately arcuate, inner margin rounded continuously and more strongly around to ventral margin; dorsoectal angle distinctly produced as a short broad arm or plate, the outer margin abruptly cut away behind this and rounded to form the ventral margin. All margins distinctly crenulate and the disk strongly concave and provided with scattered tubercles. Harpagones with arms about equally produced on either side, with about eight rounded teeth on surface facing genital plates. Apical width of harpagones one-half to two-thirds that of genital plates. Female apical plates subtriangular, thickened along inner apical margins. Lateral plates rounded postero-laterally and roundly thickened along inner posterior portion.

Color ochraceous to testaceous with black punctures with a suffusion of brownish ferrugineous on disk of pronotum posteriorly, on basal and subapical thirds of scutellum and often on humeri and apical margin of corium. Membrane generally infumed with fuscous but with the veins still darker. Apical third of scutellum white or occasionally ochraceous. Connexivum alternated with black, and ochraceous. Under surface ochraceous with brown to black punctures, the rostrum pale with brown apex. Antennae and legs reddish throughout.

Size: Male, length 9½ mm., width 5½ mm.; female, length 10¾ mm., width 7 mm.

Described from a male, Punaluu, Oahu, March 1, 1936, R. L. Usinger collector and a female, Lanihuli, Oahu, October 19, 1919, O. H. Swezey collector. Other material at hand is as follows: males, S. E. Koolau Mountains, Palolo, June 24, 1917, J. C. Bridwell; Pacific Heights, May 27, 1906; Tantalus, Oahu, January 2, 1905; Olympus, Oahu; Kaumuahonu, Oahu, June, 1908; Wahiawa, Oahu; Waialae Iki, Oahu, April 3, 1921; W. side of Mt.

Kaala, Oahu, June 1, 1919, all collected by O. H. Swezey; Tantalus, elevation 1300 ft., March 19, 1905, W. M. Giffard; three specimens, Tantalus, September, 1906, R. C. L. Perkins; Palolo, 1500 ft., September 14, 1906; and three males and three females reared from a single batch of eggs collected at Haleauau Valley, Oahu, March 8, 1936, R. L. Usinger.

Variation, as usual, is excessive but in all cases including three generations of the specimens from Haleauau, the humeri are sharply produced and the harpagones are much narrower at apices than the genital plates. The legs are usually bright red in color but teneral specimens, even among the Haleauau series, are sometimes fulvous. Hence females cannot always be distinguished with certainty from females of *grisea.* It is possible that the type of *grisea* may prove to be a pale legged form of this species because *patruelis* occurs in the vicinity of Honolulu. However, the male genitalia were not mentioned in those early descriptions and the legs were described as red only by Stål, so it seems logical to assume that *grisea* is the common pale form occurring on both Kauai and Oahu, while the name *patruelis* is assigned to the local red-legged Oahu form.

5. **Oechalia bryani** Usinger, new species

Closely allied to the recently described *hirtipes* and *virgula,* which are likewise confined to the island of Hawaii. However the former is ferrugineous in color and has numerous long, erect hairs on the legs and the latter has the harpagones strongly narrowed apically.

Head nearly as long as broad, 35 : 38; one-eighth shorter than pronotum on median line, 35 : : 40. Antennae one-fifth shorter than width of pronotum across humeri, 93 : : 116, about one-seventh shorter than combined lengths of pronotum and scutellum; proportion of segments one to five as 9 : 20 : 20 : 23 : 21. Rostrum reaching between intermediate coxae almost to hind margin of mesosternum; proportion of segments one to four as 19 : 19 : 15 : 15. Pronotum two and four-fifths as broad across humeri as long on median line, 116 : : 41; humeri strongly produced, extending about one-eighth of the total width of pronotum beyond bases of hemelytra, the tips acute, slightly elevated and directed slightly backwards, the lateral pronotal margins moderately arcuate in front of them. Connexival angles briefly but distinctly produced on posterior segments. Abdominal prolongation reaching anterior coxae, bent slightly outward or downward at middle and briefly upward at rounded apex. Legs moderately clothed with long, erect hairs, some of those on front femora over half as long as thickness of femora.

Genital plates less than one-third as wide as genital cup, 14 : : 47; about two-thirds as long as wide, the dorsal margin evenly and more strongly arcuate than adjacent rim of genital cup, the roundness continuing more strongly but uninterruptedly along inner margins. Outer dorsal angle produced slightly beyond a right angle as a brief, rounded projection. Dorsal and inner margins at least, crenulate. Elsewhere without conspicuous projections. Disk moderately concave with ill-defined tubercles. Harpagones moderately dilated at apices, the arms quite symmetrical so that an equilateral triangle is formed at apex with about nine teeth on inner margin. Distance across apices of arms

about two-thirds the width of genital plate. Female genital plates not distinctive.

Color ochraceous with dark brown to black punctures. Punctured areas of head black and smooth areas whitish ochraceous. Pronotum with callosities pale, the punctured areas of humeri somewhat suffused with black and the apices tinged with reddish. Scutellum lightly infuscated basally and subapically, white at apex. Membrane lightly infuscated with dark brown veins. Punctured portion of connexivum black, the impunctate margins pale. Under surface ochraceous with shallow, light brown punctures, the legs, except at bases, fulvous or even slightly tinged with reddish, especially apically. Apex of rostrum and tips of claws brown. Antennae fulvous basally and ferrugineous apically.

Size: Male, length 9½ mm., width 5½ mm.; female, length 11 mm., width 6½ mm.

Holotype, male, allotype, female, and five male and five female paratypes, Hookomo, South Slope of Mauna Kea, 8500 feet elevation, August 9, 1935, on *Sophora,* R. L. Usinger.

This species is smaller than other species from Hawaii with the abdominal prolongation longer, the legs less hairy, and the humeri bent slightly but distinctly backwards. Other specimens which apparently belong here include seven specimens, Nauhi Gulch, Hawaii, 5000 to 6000 ft., September 30, 1931, on ohia lehua, O. H. Swezey and F. X. Williams, and four specimens, Kahuku, Kau, Hawaii, January 15, 1917, W. M. Giffard collector. Apparently the species is confined to Mauna Kea and its environs.

It gives me great pleasure to name this species after Mr. E. H. Bryan, Jr., with whom I was associated during the first days of collecting on the Hawaiian Academy of Science Mauna Kea Expedition at which time the type series was collected.

6. **Oechalia acuta** Usinger, new species

A large dark colored species with straight, acute humeral spines as in *hirtipes* but with less hairy legs, slightly different male genitalia, and with ferrugineous color.

Head nearly as long as broad, 43 : : 44, distinctly shorter than pronotum on median line, 43 : : 50. Antennae about one-twelfth shorter than width of pronotum across humeri, 121 : : 132; nearly as long as combined lengths of pronotum and scutellum, 121 : : 128; proportion of segments one to five as 10 : 25 : 27 : 33 : 26. Rostrum reaching between middle coxae nearly to hind margin of mesosternum; proportion of segments one to four as 22 : 22 : 18 : 17. Pronotum about two and two-thirds as wide across humeri as long on median line, 132 : : 50; humeri strongly produced, acute, extending about one-ninth the total width of pronotum beyond bases of hemelytra, the margin of pronotum in front of them feebly arcuate. Connexival angles briefly produced on posterior segments. Abdominal prolongation relatively short, reaching only to middle of mesosternum, bent outward or downward apically. Legs only sparsely hairy, the erect hairs of the femora scarcely half as long as greatest thickness of femora.

Genital plates less than one-third as wide as genital cup, 15 : : 52, about two-thirds as long as wide, 10 : : 15; top margin only feebly arcuate, inner

margin subangulately rounded, outer dorsal angle produced slightly beyond a right angle, the outer side straight, inner margin with a series of peg-like tubercles, elsewhere crenulate with the disk moderately concave and irregularly tuberculate. Harpagones moderately dilated apically, two-thirds as broad across apices of arms as width of genital plates, 10::15; arms about equally developed, though the ventro-ectal margin at apex is slightly arcuate; inner face with about six teeth. Female genital plates not distinctive.

Color whitish ochraceous but broadly suffused with dark brown to black including punctures, punctate areas of head, pronotal callosities and more or less of disk near and on the humeri, scutellum basally and subapically, corium except laterally and apically, and punctured portion of corium. Membrane generally infuscated with darker veins. Apex of scutellum white. Under surface pale with brown punctures, the legs fulvous, tip of rostrum and apices of claws brown, antennae pale brown basally and light ferrugineous apically.

Size: male, length 11½ mm., width 6½ mm.; female, length 12 mm., width 7¼ mm.

Holotype, male, and allotype, female, Kilauea, Hawaii, August 18, 1935, R. L. Usinger collector. Many additional, more or less typical specimens are at hand, all collected at Kilauea by Giffard, Bryan, Clark, Swezey and Timberlake. Additional specimens from South Kona and from Waimea, upper Hamakua Ditch Trail and elsewhere in or near the Kohala Mtns. are indistinguishable, on the basis of present criteria, from the Kilauea specimens.

The four species of *Oechalia* with acute humeri which occur on Hawaii overlap somewhat in range. Thus *hirtipes, virgula,* and *acuta* occur at Kilauea. *Hirtipes* and *acuta* appear to be close allies with similar straight humeri and short abdominal prolongation, *hirtipes* having diverged with its hairy legs and ferrugineous color from the more widespread *acuta. Bryani* and *virgula* are likewise close, both being somewhat smaller with the humeri bent slightly backwards and the abdominal prolongation relatively long. *Bryani* appears to be confined to the environs of Mauna Kea while *virgula* exhibits a spotted distribution.

7. **Oechalia virgula** Van Duzee

Oechalia virgula Van Duzee, 1936, Proc. Haw. Ent. Soc., 9:220.

Very similar in general appearance to *grisea* and *patruelis* with similar sharp humeri but with fulvous or paler legs bearing longer and more numerous erect femoral hairs and with the harpagones very slender, actually narrowed or compressed at the tip rather than expanded as in all other known Oechalias except *similis.*

Head nearly as long as broad, 38::40, and only slightly shorter than pronotum on median line, 38::43. Antennae about four-fifths as long as combined lengths of pronotum and scutellum, 96::118; proportion of segments one to four as 9:20:20:25:22. Rostrum reaching middle of intermediate coxae, the proportion of segments one to four as 19:17:15:16. Pronotum nearly three times as broad as long, 121::43; humeri strongly produced and slightly elevated, extending one-eighth of the total width of pronotum beyond bases of hemelytra, acute and directed slightly backward, the front

margin of each humerus humped. Puncturation of upper surface as in related species except on the scutellum where the punctures are somewhat sparser, leaving frequent smooth areas more than one puncture width in extent laterally and medially. Connexival angles feebly produced anteriorly, more distinctly so posteriorly, acute. Abdominal prolongation reaching nearly or quite to front margin of mesosternum. Femora relatively thickly beset with erect hairs or bristles at least some of which are one-half to two-thirds as long as thickness of femora.

Genital plates a little more than one-third as wide as genital cup, 18::51; suboval in outline, being over two-thirds as long as wide, 14::18; dorsal margin feebly but evenly arcuate, inner and ventral margins continuously rounded, and outer margin so broadly and roundly produced anteriorly that it does not appear as a distinct arm or projection, the outer margin broadly emarginate posteriorly. All the margins irregularly crenulate and the disk very strongly concave and distinctly tuberculate. Harpagones asymmetrical at apices, the ectal arms entirely wanting, resulting in an obliquely truncate apex with only about five teeth on the sloping inner face; width at apex about one-third the width of genital plates, 7::18. Female genital plates scarcely differing from those of allied species, only the lateral plates appearing slightly less rounded and more produced.

Color ochraceous with black punctures and generally suffused dark brown to black on humeri, at base of scutellum medially and more lightly so on subapical third and on inner apical portion of corium. Membrane subhyaline with the veins distinctly brown. Punctate portion of connexivum entirely black, the narrow marginal smooth area ochraceous with black posterior angles. Under surface ochraceous or paler with fuscous punctures, the smooth areas of mesosternum, internal sides of genital cup, genital plates and apices of harpagones brown. Legs and antennae rather generally fulvous, appearing somewhat paler basally and darker fulvous apically. Only the tarsal claws brown. Rostrum ochraceous with brown apex.

Size: male, length 10½ mm., width 5½ mm.; female, length 13½ mm., width 7½ mm.

Described from the male holotype, Puuwaawaa, North Kona, Hawaii, 3,700 ft., August 25, 1917, W. M. Giffard collector. Male paratypes are at hand as follows: three specimens, same data as type; four specimens, Kilauea, Hawaii, 4,000 feet, January 19, 1917, W. M. Giffard collector from the Frederick Muir collection; one specimen same as the latter but taken on January 14; and two specimens from the dry forest, Hawaii, January, 1917, Frederick Muir collector. Material at hand other than paratypes includes four males as follows: Kilauea, Hawaii, June 27, 1917, on koa, O. H. Swezey; Kilauea, Hawaii, April, 1927, N. Krauss; Kilauea, 29 miles, 4,000 feet, August 21, 1917, W. M. Giffard; and one specimen without locality but collected on *Myoporum*. A single female is at hand from Kilauea, Hawaii, June 27, 1917, collected on *Dodonaea* by O. H. Swezey. All of the males can be identified with certainty because of the entirely unique form of the harpagones. They are all from the island of Hawaii. Hence it seems certain that Mr. Van Duzee's allotype from Oahu pertains to the common Oahu species with sharp humeri and fulvous legs, namely *grisea*. Females of this species unfortunately can be identified safely only by association with the distinctive males. The single female listed above

is the only one which I have been able to place with certainty as this species.

8. **Oechalia hirtipes** Van Duzee

Oechalia hirtipes Van Duzee, 1936, Proc. Haw. Ent. Soc., 9: 221-222.

A species with strongly produced, acute humeri and a general ferrugineous color over most of the body.

Head about as long as broad, 43::42, and only slightly shorter than pronotum on median line, 43::45. Antennae nearly as long as combined lengths of pronotum and scutellum, 116::121; proportion of segments one to five as 9:21:27:30:29. Rostrum reaching middle of intermediate coxae; the proportion of segments one to four as 22:23:15:15. Pronotum nearly three times as broad across humeri as long on median line, 130::45; the humeri strongly, evenly produced, acute, extending one-eighth of the width of pronotum beyond bases of hemelytra and only slightly elevated. Abdominal prolongation reaching about to middle of mesosternum. Legs rather densely hairy, the femora with numerous erect hairs over two-thirds as long as the thickness of femora.

Genital plates less than one-third the total width of genital cup, 15::51; half again as wide as long, 15::10; dorsal margin only feebly arcuate, inner margin produced into a 45° angle and then continuing sinuately along ventral margin to outer ventral angle which is subrounded. Outer margin produced dorso-laterally as a broad, rounded lobe. All except outer margin crenulate, the disk concave and distinctly tuberculate. Harpagones distinctly dilated apically, the outer arms most strongly produced. Width across tips of arms nearly two-thirds the width of a genital plate, 9::15, the side nearest genital plate with about nine rounded teeth. Female genitalia much as in relafed species, the apical plates slightly less strongly produced and the lateral plates very evenly rounded posteriorly.

Color ferrugineous with black punctures, the humeri black, the base and subapex of scutellum dark with apex very pale. Membrane slightly infuscated with the veins dark brown. Punctured portion of connexivum black with paler smooth margins. Under surface including legs, antennae, and rostrum ochraceous, but generally tinged throughout with ferrugineous or rufous and with fuscous punctures.

Size: male, length 11 mm., width 6½ mm.; female, length 13 mm., width 7 mm.

Described from the male and female holotype and allotype from Kilauea, Hawaii, February 24, 1919, O. H. Swezey collector. The paratypes are a heterogeneous mixture of females which are treated elsewhere under the appropriate species. This species is very distinct from all others known to me. The precise limits of variability cannot be determined without a great deal more material.

9. **Oechalia ferruginea** Usinger, new species

This is the only member of the group of species with subrounded humeri known to occur on Hawaii. The humeri are more strongly produced than in other members of this group and the color is ferrugineous.

Head as long as wide across eyes, shorter than pronotum on median line, 44::51. Antennae much shorter than combined lengths of pronotum and scutellum, 98::135; proportion of segments one to five as 10:24:21:23:20. Rostrum reaching middle coxae; proportion of segments one to four as 22:23:17:16. Pronotum nearly two and one-half times as broad across humeri as long, 124::51, the humeri moderately, angularly produced, subrounded at apices, extending one-twelfth of the total width of pronotum beyond bases of hemelytra on either side. Abdominal prolongation extending nearly to front coxae, bent downward and then briefly reflexed at rounded apex. Femora sparsely clothed with erect hairs which are one-half as long as thickness of femora. Female genitalia scarcely distinctive, the apical plates relatively slender.

Color rather uniformly ferrugineous with black punctures, scutellar and hemelytral disks nearly concolorous, the pale area on apex of scutellum scarcely discernible. Membrane more or less infuscated with the veins darker. Connexivum ochraceous along extreme lateral margins, the punctate region alternated with black and ferrugineous. Under surface and legs reddish, more or less marked with brown or black. Antennae basally and rostrum brownish, the latter darker brown apically.

Size: female, length 11½ to 12½ mm., width 6¼ to 7 mm.

Holotype, female, Kilauea, Hawaii, 4,000 feet, June 8, 1918, W. M. Giffard. Paratypes, two females, Kau Road, Hawaii, January 16, 1917, W. M. Giffard collector, and one female, Kilauea, Hawaii, 3,000 feet, December, 1905.

Four of the specimens before me bear Van Duzee paratype labels of *Oechalia hirtipes* but, as in the case of the type series of *virgula,* various species were confused under a single name. *Ferruginea* differs from the type specimens of *hirtipes,* which are before me, in its short, subrounded humeri, ferrugineous color, long abdominal spine, and entirely unique proportions of antennal segments, this being the only known species with the second segment longest and fifth segment shortest. In general it is not advisable to name Oechalias on the basis of females alone, but the present species is so distinctive that there can be little doubt as to its identity.

A single female from Kaholuamanu, Kauai, April, 1920, J. A. Kusche, likewise bearing a paratype label of *hirtipes,* is closely allied to *ferruginea* and may be identical with it. The antennal proportions are similar and the abdominal spine is likewise strongly produced. The ferrugineous color is much less pronounced, however. In the absence of male specimens it seems best to reserve judgment on this interesting specimen.

10. **Oechalia pacifica** (Stål)

Arma pacifica Stål, 1859, Kongl. Svenska Fregattens Eugenies Resa Omkring Jorden. Insekter III, p. 221.

Oechalia pacifica Stål, 1870, Enum. Hemipt., 1: 59.

Oechalia pacifica, White, 1878, Ann. Mag. Nat. Hist., (5) 1: 367.

Oechalia pacifica, Kirkaldy, 1909, Proc. Haw. Ent. Soc., 2: 83, pl. 2, fig. 2.

Head nearly as long as broad, 39::40; shorter than pronotum on median line, 39::43. Antennae subequal to width of pronotum across humeri; one-eleventh shorter than combined lengths of pronotum and scutellum, 102::112; proportion of segments one to five as 9:21:21:27:24. Rostrum reaching between middle coxae, the proportion of segments one to four as 19:20:15:15. Pronotum two and two-fifths times as wide across humeri as long as median line, 102::43; humeri briefly, angulately produced, reaching one-fourteenth of the total width of pronotum beyond bases of hemelytra, the apices obtusely rounded and not at all elevated. Abdominal prolongation reaching front coxae, bent downward on apical half, its tip rounded and a little enlarged on upper side. Femora sparsely clothed with erect hairs, which are shorter than greatest thickness of femora.

Genital plates relatively large, two-fifths as wide as total width of genital cup, 19::47; about three-fourths as long as wide; dorsal margin rounded about as the dorsal margin of genital cup, inner margin more strongly, rather evenly rounded except for a feeble subangular point at middle, outer dorsal angle very broadly and strongly produced, the projecting plate rounded, ventral margin below this rounded and provided with three very prominent teeth. Margins crenulate and disk strongly concave with numerous distinct tubercles. Harpagones strongly asymmetrical, the ental arms produced upward almost as a continuation of inner edges of harpagones while the ectal arms are abruptly bent downward; width measured obliquely across apices of harpagonal arms about three-fifths that of genital plates, 12::19; inner face with about eight teeth.

Color brownish ochraceous more or less suffused with ferrugineous, the punctures dark brown to black. Head with the usual pale areas and with punctate areas black. Pronotum ochraceous along anterior margin, surrounding and just behind callosities and broadly along lateral margins though narrowing near humeri. Humeri dark piceous brown. Scutellum more or less suffused with dark brown on basal and subapical fourths, white apically. Membrane generally infuscated with darker brown veins. Connexivum pale along narrow impunctate margins except at sutures, often distinctly alternated with pale at middle of punctate portions of segments. Under surface pale with brownish punctures, the legs ochraceous with obscure brown spots, tarsi darker with black tipped claws. Antennae brownish basally becoming ferrugineous apically.

Size: male, length 10 mm., width 5 mm.; female, length 11½ mm., width 6 mm.

Described from a male collected by Blackburn on Oahu, which agrees perfectly with Stål's description, and from a female, Tantalus, Oahu, elev. 1,300 ft., April 16, 1905, W. M. Giffard. There can be little doubt as to the identity of this species though Kirkaldy (1909) confused it hopelessly, first as a variety of *grisea* with sharp humeri (plate 2, fig. 3) and then (on the following page) as a synonym of *grisea* with blunt humeri. Stål's description is very clear and this is the only form occurring on Oahu to which it might pertain. Ten additional specimens are at hand from both lowlands and highlands of the Waianae and Koolau Mountains. Variation is excessive, some specimens being quite pale and others generally infuscated while the size ranges up to a large female 13 mm. long and 7 mm. wide. All agree, however, in possessing blunt humeri, large, strongly convex genital plates with broad dorso-lateral plate-like projection, and strongly asymmetrical harpagones.

Material from other islands is equally characteristic, but even more variable as follows: Kauai, nineteen specimens mostly from the vicinity of Kokee collected at scattered intervals throughout the year. Size, coloration, and genitalia as in Oahu forms. Molokai, four large dark females from Kainalu and Puu Kolekole. Lanai, two males and a female, rather dark, of moderate size with genitalia as in Oahu forms. Maui, eighty specimens varying from small to exceedingly large and mostly rather dark. Localities range from lowlands to highlands and include both West and East Maui. The genital plates are less strongly concave and the harpagones are less strongly asymmetrical but the differences are so slight that they merely suggest the development of an incipient subspecies.

11. **Oechalia similis** Usinger, new species

Very similar to *pacifica* but with male harpagones slender, beveled to a sharp edge at apices as in *virgula* from Hawaii.

Head shorter than broad including eyes, 38::41, and still shorter than pronotum on median line, 38::43. Antennae about one-sixth shorter than greatest width of pronotum, 92::108; proportion of segments one to five as 9:20:18:23:22. Rostrum reaching between intermediate coxae to hind margin of mesosternum; proportion of segments one to four as 18:18:15:15. Pronotum two and one-half times as broad as long on median line, 108::43; humeri produced about one-fourteenth of the entire width of pronotum beyond bases of hemelytra, the lateral margins just in front of humeri arcuate and a little elevated, the margins behind briefly straight and then arcuate, the actual apices depressed and angulate but narrowly rounded at tips. Dorsum punctured much as in other species but with base and apex of scutellum broadly impunctate. Abdominal prolongation very long, reaching at least to hind margin of prosternum, bent outward or downward toward the apex. Femora sparsely beset with erect hairs which are less than half the thickness of femora.

Genital plates relatively large, three and one-third times as wide as total width of genital cup, about two-thirds as long as wide, the upper edge feebly and the inner edge strongly rounded. Dorso-lateral angle rather strongly produced and then gradually narrowed below to ventro-lateral angle. Genital plates unusually deeply concave, the edges crenulate as usual and the disks relatively densely covered with prominent, sharp tubercles. Harpagones without distinct arms, the apices simply appearing triangular with about five teeth on inner face. Width across ectal and ental angles less than half the width of genital plates, 6::15. Female genital plates narrower and more strongly produced than in *pacifica,* the basal plates in particular with hind margins straight and directed obliquely, forming acute angles at inner apices.

Color much as in dark *pacifica,* dark brown to black with dark punctures, with longitudinal head stripes, smooth areas surrounding eyes, median portion of anterior margin and anterior, crenulate halves of lateral margins ochraceous. Elsewhere the pronotal disk at middle and the scutellar disk laterally on basal half are ochraceous while the apical fourth of scutellum is white. Membrane brownish hyaline with dark brown veins. Beneath generally pale fulvous to testaceous with shallow light brown punctures, the legs fulvous with tips of claws black. Antennae fulvous on smooth basal half, then tinged with ferrugineous. Rostrum embrowned at apex. Eyes dark brown.

Size: male, length 9¾ mm., width 5⅓ mm.; female, length 12 mm., width 6 mm.

Holotype, male, and allotype, female, Kula Pipe Line, Maui, 4,500 ft. elev. April 8, 1932, Owen Bryant collector.

This interesting species is somewhat parallel to *virgula* of Hawaii, a species which is scarcely distinguishable from *acuta* except for the narrowed apices of harpagones. The present case represents a similar phenomenon in the group of *Oechalias* with blunt humeri which are so common on the neighboring island of Maui.

12. **Oechalia suehiroae** Usinger, new species

Oechalia kaonohi, Van Duzee, 1936, Proc. Haw. Ent. Soc., 9:221. (*nec* Kirkaldy).

Allied to *pacifica* with similar rounded apices of humeri but brownish ferrugineous in color and with the male genital plates scarcely wider than the strongly dilated apices of harpagones.

Head nearly as long as broad across eyes, 39::40; distinctly shorter than pronotum on median line, 39::44. Antennae (measured in the Iao Valley specimen) one-tenth shorter than width of pronotum across humeri, 99::108; proportion of segments one to five as 11:21:21:25:21. Rostrum (on holotype) reaching between intermediate coxae nearly to hind margin of mesosternum; proportion of segments one to four as 19:19:14:14. Pronotum two and one-half times as broad across humeri as long on median line, 108::44; humeri moderately, angularly produced, extending for about one-sixteenth the total width of pronotum beyond the bases of hemelytra, rounded at apices and not at all elevated. Puncturation rather uniform over the entire upper surface including apical fourth of scutellum, the punctures of hemelytra somewhat finer and more numerous and the connexival punctures, as usual, very fine and dense. Abdominal prolongation bent abruptly outward at level of middle coxae, rounded and turned briefly upward at extreme apex, reaching level of anterior coxae. Hairs of femora (taken from Iao Valley male) erect and rather numerous but shorter than half the thickness of femora.

Genital plates small, one-fourth as wide as entire genital cup, 13::51; about three-fourths as long as wide; dorsal margin nearly straight, inner margin rather strongly but evenly rounded, outer margin briefly rounded at a subacute dorso-lateral angle, then concave just below this and rounded at ventro-lateral angle; margins all crenulate as usual but concave disk less conspicuously tuberculate. Harpagones rather strongly dilated apically, about five-sixths as wide across apices of arms as width of genital plate, 11::13; the ectal arm longer, more elevated, and more slender than the ental arm; inner face with about nine smooth teeth.

Color rather uniformly brownish-ferrugineous with dark brown to black punctures, the punctate areas of head suffused with black as also the inner base of membrane adjacent to apex of scutellum, and the punctate portion of connexival segments except laterally at middle of each segment. Membrane subhyaline, the veins dark brown to black. Middle of anterior margin, serrate anterior halves of lateral margins of pronotum and smooth areas surrounding eyes ochraceous to ivory white. Antennae and rostrum brownish ferrugineous becoming darker apically. Abdominal prolongation broadly ivory white at tip.

Size: male, length 9¾ mm., width 5½ mm.; female, length 10½ mm., width 5⅔ mm.

Holotype, male, Haleakala, Maui, 5,000 ft., April, 1894, R. C. L. Perkins. Allotype, female, Haleakala, Maui, July 22, 1919, elev. 5,800 ft., P. H. Timberlake. One female paratype, Haleakala, Maui, over 5,000 ft., October, 1896, R. C. L. Perkins. An additional female which is somewhat larger with more coarsely punctured scutellum marked with black basally and subapically and paler at apex, with the connexivum distinctly alternated and the membrane darker, is at hand from Haleakala, 5,000 ft., July 19, 1919, P. H. Timberlake, and an apparently typical male was collected by Mr. Swezey at Iao Valley, Maui, August 8, 1918 (listed by Van Duzee as *kaonohi*).

Although closely related to *pacifica,* this is a very distinct species. It is recognizable at a glance because of its ferrugineous color while the smaller genital plates and relatively broader harpagones will readily separate it structurally. The species is gratefully dedicated to Miss Amy Suehiro who so patiently carried on the rearing of Oechalias through three generations, thus establishing the limits of variation within a single species.

13. **Oechalia swezeyi** Usinger, new species

Allied to *pacifica* and *ferruginea* with similar blunt humeri but with the genital plates very small, the harpagones nearly symmetrical and about three-fourths as wide across apical arms as the width of plates, and the color of the body rather uniformly pale, whitish testaceous with brown punctures.

Head nearly as long as broad across eyes, 38::40; about one-fifth shorter than pronotum on median line, 38::48. Antennae distinctly shorter than combined lengths of pronotum and scutellum, scarcely shorter than pronotal width across humeri, 106::110; proportion of segments one to five as 8:22:24:27:25. Rostrum reaching about to middle of intermediate coxae, proportion of segments one to four as 22:20:15:16. Pronotum two and one-third times as broad across humeri as long on median line, 111::48; humeri moderately produced into a brief, rounded projection, extending about one-sixteenth of the total width of pronotum beyond the bases of hemelytra. Dorsal surface evenly, relatively finely punctate, the punctures even extending lightly onto apical fourth of scutellum except along median line. Abdominal prolongation nearly straight, attenuated apically and reaching a little beyond middle of mesosternum. Femora sparsely clothed with erect hairs which are less than half as long as thickness of femora.

Genital plates small, about one-fourth as wide as genital cup, 12::46; about three-fourths as long as wide, the dorsal margin arcuate following contour of dorsal margin of genital cup, obtuse angulately deflected at inner dorsal angle and obtusely angulate at middle of inner margin. Outer dorsal angle roundly produced, then concave below this and rounded at outer ventral angle. All the margins are irregularly crenulate and the surface is concave and irregularly tuberculate. Harpagones with well developed, rather symmetrical arms, the ectal arm slightly longer and more slender than the ental arm. Width across apices of harpagonal arms five-sixths as great as width of genital plates. Female genital plates scarcely distinctive, the apical plates rather more broadly rounded and less produced.

Color white or testaceous with brown punctures, the eyes, punctures around ocelli, extreme tips of humeri, inner posterior area of connexivum, tips of claws and apex of rostrum dark brown. Membrane suffused with dark brown at inner base, elsewhere clear hyaline with brown veins. Callosities light brown. Pale areas of dorsum sometimes slightly tinged with pink or ferrugineous. Antennae smooth and light brown on basal half, roughened and becoming ferrugineous apically.

Size: male, length 10¼ mm., width 5⅓ mm.; female, length 11 mm., width 5⅔ mm.

Holotype, male, allotype, female, and one male paratype, Kanoa, Molokai, January 25, 1929, O. H. Swezey collector. A female taken on Maui by Koebele and a female, Honolulu, Oahu, 2,000 ft., April, 1892, R. C. L. Perkins, appear to be perfectly typical.

This species may be separated from all others by its briefly produced, rounded humeri, pale coloration, and small genital plates with relatively strongly dilated harpagones. It is a pleasure to dedicate this distinctive species to Mr. O. H. Swezey through whose assiduous collecting so many Oechalias have been assembled during the past thirty years.

14. **Oechalia kaonohi** Kirkaldy

Oechalia grisea, Swezey, 1905, H.S.P.A., Exp. Sta. Div. Ent., Bull. 1, pt. 7, p. 236, pl. 17, fig. 5.

Oechalia kaonohi Kirkaldy, 1909, Proc. Haw. Ent. Soc., 2: 82-83, Pl. 2, fig. 1 and text fig. b.

Oechalia kaonohi, Perkins, 1913, Fauna Haw., Intro., p. 191.

Oechalia grisea, Williams, 1931, Handbook of the Insects and other Invertebrates of Hawaiian Sugar Cane Fields. Honolulu, pp. 96-97, plate XIII, figs. 5 and 7.

Oechalia grisea, Swezey, 1936, Bull. Exp. Sta. H.S.P.A., Ent. Series, 21: 91, plate 5, figs. 5 and 7.

A long, slender species with scarcely produced, roundly angular humeri.

Head scarcely longer than broad across the eyes, 42::41; slightly shorter than pronotum on median line, 42::45. Antennae one-sixth shorter than combined lengths of pronotum and scutellum, 103::122; proportion of segments one to five as 9:22:24:25:23. Rostrum extending between middle coxae to hind margin of mesosternum; proportion of segments one to four as 22:22:16:16. Pronotum scarcely more than twice as broad across humeri as long, 95::45; humeri very slightly produced, extending only one thirty-second of the width of pronotum beyond bases of hemelytra, roundly angulate and only moderately elevated. Subhumeral spines weakly developed. Abdominal prolongation subappressed or at least less strongly divergent than in related species, reaching nearly to front margin of mesosternum. Femoral hairs relatively short, less than half as long as thickness of femora, and comparatively sparse.

Genital plates slightly over one-third as wide as genital cup, 18::52; and two-thirds as long as wide; dorsal margin rather evenly arcuate following the curve of dorsal rim of genital cup, then more abruptly rounded and a little sinuate at inner dorsal angle below which is a rounded projection, ventral margin rather evenly arcuate and feebly, roundly emarginate laterally beneath produced dorso-lateral area; all margins irregularly crenulate and the disk moderately concave and sparsely covered with small, rounded tuber-

cles. Harpagones asymmetrical at apices, the ectal arms more slender and longer than the ental arms; the arms strongly dilated, the distance across apices nearly as great as width of genital plates, 17::18; inner edge with about eleven rounded teeth.

Color ochraceous with black punctures and with a metallic tinge to the suffused black areas of head. Suffused with dark brown on humeri, and basal and subapical fourths of scutellum, the apical fourth of scutellum, sublateral vein and lateral and apical margins of corium and lateral margins of connexivum posteriorly ivory-white. Punctate portions of connexivum pale laterally and posteriorly, the postero-lateral angles minutely black. Membrane brownish subhyaline with dark brown veins. Under surface pale ochraceous with light brown punctures becoming darker brown on propleura. Legs except basally and at joints fulvous. Antennae fulvous on basal half, roughened and ferrugineous apically. Rostrum fulvous at tip.

Size: male, length 11 mm., width 4½ mm.; female, length 11½ mm., width 4¾ mm.

The male holotype, Naalehu, Hawaii, May 4, 1905, is before me. It has been badly damaged by dermestids so that only the abdominal prolongation, fragments of the middle legs, and the dorsal surface of scutellum and hemelytra remain. The genital capsule is mounted on a card on the same pin and is perfect. The above description was taken from a male, Pahala, Hawaii, May 21, 1915, and a female, Puna, Hawaii, 1,500 feet. Another female is at hand from Hawaii collected by the Rev. T. Blackburn and a female and nymph from Olaa, Hawaii, July, 1903, are mounted on a card, the nymph with its beak inserted in a sugar cane leafhopper. Still another apparently typical female was collected by Blackburn on Maui while a slightly smaller but apparently typical female is at hand from Lihue, Kauai, March 31, 1912.

Kaonohi is one of the most distinctive species in the genus, the long slender form and very broad harpagonal arms being unique among the species of *Oechalia* known to me. This is the species which Swezey (1905) studied and illustrated under the name *grisea.* Kirkaldy later described it as a new species but the original name, *grisea,* has since been used by Williams (1931) and Swezey (1936) who reprinted the original plate of illustrations. I can find no specimens of this species collected during the past twenty-five years.

BIBLIOGRAPHY

Baker, A. D. 1931. A Study of the male genitalia of Canadian species of Pentatomidae. Canad. Jour. Res., Ottawa, 4: 148-179, 21 figs.

Bergroth, E. 1891. Contributions à l'étude des Pentatomides. Revue d'Entomologie, 10: 200-208.

Blackburn, T. 1888. Notes on the Hemiptera of the Hawaiian Islands. Proc. Linn. Soc. N. S. Wales (2) 3: 343-354.

Boisduval, J. A. 1835. Voyage de l'Astrolabe, pendant les années 1826-29, faune entomologique de l'ocean Pacifique, 2: 630, pl. II, fig. 9.

Burmeister, H. C. C. 1834. Rhyngota seu Hemiptera. Beiträge zur Zoologie gesammelt auf einer Reise um die Erde, von Dr. F. J. F. Meyen. Nova Acta Acad. Leop., XVI, suppl. p. 293.

Guérin-Méneville, F. E. 1838. L'entomologie du voyage autour du monde sur la Corvette la Coquille. Zool. 2: 166, pl. 11, fig. 9.
Gulde, J. 1919. Die Larvenstadien der Asopiden. Deutsch. Ent. Ztschr., 1919: 45-55, 3 Abd.
Heymons, R. 1906. Über einen Apparat zum Öffnen der Eischale beiden Pentatomiden. Ztschr. f. wiss. Insektenbiol., 2: 73-82, 2 figs.
Kirkaldy, G. W. 1902. Fauna Hawaiiensis. Hemiptera. 3: 93-174, pls. IV and V.
1907. Biological Notes on the Hemiptera of the Hawaiian Isles. No. 1. Proc. Haw. Ent. Soc., 1: 135-161, 4 figs.
Kirkaldy, G. W. 1908. A list of the described Hemiptera (excluding Aleyrodidae and Coccidae) of the Hawaiian Islands. Proc. Haw. Ent. Soc., 1: 186-208, plate 4.
1909a. Notes on the Hemipterous genus *Oechalia*. Proc. Haw. Ent. Soc., 2: 82-84, plate 2 and figures.
1909b. Catalogue of the Hemiptera (Heteroptera) with biological and anatomical references, lists of food plants and parasites, etc. Vol. I. Cimicidae. Berlin. xl + 392 pp.
1910. Fauna Hawaiiensis. Supplement to Hemiptera. 2: 531-599.
Kirkland, A. H. 1897. The species of Podisus occurring in the United States. Rept. Massachusetts St. Bd. Agric., 45: 412-438, pl. 1.
Knight, H. H. 1923. Studies on the life history and biology of Perillus bioculatus Fabricius, including observations on the nature of the color pattern. 19th Rept. St. Ent. Minnesota, for 1922: 50-99, pls. 1-3, fig. 1.
Mayr, G. L. 1868. Hemiptera, in Reise der Osterreichischen Freggate Novara um die Erde in den Jahren 1857, 1858, 1859. Zool. Teil, II, Abt. 1, p. 32.
Perkins, R. C. L. 1913. Fauna Hawaiiensis. Introductory Essay on the Fauna. Vol. I, Part VI, pp. i-ccxxviii, 16 plates.
Schouteden, H. 1906. Genera Insectorum. Heteroptera. Fam. Pentatomidae. Subfam. Asopinae (Amyoteinae). Fasc. 52: 1-82, 5 pls.
Schumacher, F. 1910-1911. Beiträge zur Kenntnis der Biologie der Asopiden. Ztschr. f. wiss. Insektenbiol., 6: 263-266, 376-383, 430-437; 7: 40-47, 15 figs.
Stål, C. 1859. Kongl. Svenska Fregattens Eugenies Resa Omkring Jorden. 1851-1853. Stockholm, Norstedt, 1858. 4. Insekter, III, pp. 219-298, Tab. 2.
1862. Hemiptera Mexicana. Stettin. Ent. Zeit., 23: 93, footnote.
1864. Hemiptera Africana. Stockholm. 1: 1-256.
1870. Enumeratio Hemipterorum. Hemiptera. I. Kongl. Svenska Vet. -Akad. Handl., Band. 9, No. 1, pp. 1-232.
Swezey, O. H. 1905. Leaf-Hoppers and their Natural Enemies. Pt. VII. Orthoptera, Coleoptera, Hemiptera. Rept. Exp. Sta. H.S.P.A. Div. of Ent. Bull. 1: 211-238, 4 plates.
1936. Biological Control of the Sugar Cane Leafhopper in Hawaii. Bull. Exp. Sta. H.S.P.A., Ent. Series, 21: 55-101, 23 figs., 6 plates.
Van Duzee, E. P. 1936. A Report on Some Heteroptera from the Hawaiian Islands, with Descriptions of New Species. Proc. Haw. Ent. Soc., 9: 219-229.
Walker, F. 1867. Catalogue of the specimens of Hemiptera Heteroptera in the collection of the British Museum. London, Part 2.
White, F. B. 1878. Descriptions of new species of heteropterous Hemiptera collected in the Hawaiian Islands by the Rev. T. Blackburn, No. 2. Ann. Mag. Nat. Hist. (5) 1: 365-374.
Williams, F. X. 1931. Handbook of the Insects and Other Invertebrates of Hawaiian Sugar Cane Fields. Honolulu, 400 pp. 41 plates, 190 figs.